

## **COUNTING THEORY --- MIXED REVIEW**

1) A store makes custom paints using a base, texture and a pigment. If the store has three different bases, two textures, and fifty pigments, how many different custom paints can be mixed?

2) Each of the eight questions on a multiple choice test has three possible answers. If all questions are answered, in how many different ways can the test be completed?

3) In how many different ways can nine baseball players' names be listed in a column on a roster?

4) Six people volunteer to help put out a fire. In how many different ways can they be lined up in a row to hold the hose?

5) How many ways can ten students be seated in a row of five seats?

6) *Parking*: In how many different ways can three cars be parked in ten spaces?

7) *Ice Cream*: In how many ways can you choose two ice cream flavors out of twenty-six possible flavors?

8) *License Plates*: How many six digit license plate numbers can be produced if you can repeat any digits? How many can be produced if you can not repeat any digits?

9) *Lottery*: To raise money the alumni association printed lottery tickets with the numbers 1 through 11 printed on each ticket. To play the lottery, one must circle three numbers on the ticket. In how many ways can three numbers be chosen out of the 11 numbers on the ticket?

$$11C_3 = 165$$

*10) Committees:* A company employs nine male welders and seven female welders. A committee of three male welders and two female welders is to be



11) *Drawing Cards* --- How many different 13-card hands include the ace and king of spades?

12) *Parading Order*: A small Mardi Gras parade consists of eight floats and three marching bands. In how many different orders can they line up?

$${}_{11}P_{11} = 39,916,800$$

*13) Marching Bands:* In how many ways can four marching bands and three floats line up for a parade if two bands cannot march next to one another?

14) *Final Exam* --- Professor Indiana Jones gives his class 20 study questions, from which he will select 8 to be answered on the final exam. How many different final exams are possible?

$$20^C_8 = 125,970$$

15) *Photo Shoot*: The eight high school cheerleaders are to have their pictures taken for the Eagle, their yearbook. How many different ways can three of the cheerleaders be chosen and lined up for each action shot?

Perm.

$$8P_3 = 336$$

*16) Geometry:* How many diagonals can be drawn in a decagon?

(A Decagon is a polygon with 10 vertices and 10 sides.)

(A diagonal is a segment that connects any two nonconsecutive vertices of a polygon.)

17) *Numbers:* How many 4-digit positive even integers are there?

$$\underline{9} \cdot \underline{10} \cdot \underline{10} \cdot \underline{5} = 4500$$

18) *Study Groups:* A math class consisting of 18 males and 12 females is preparing for the final exam. --- How many study groups of 5 can be formed?

18 m  
12 f

$$30^C_5 = 142,506$$

--- How many study groups of 2 males and 3 females can be formed?

$$18^C_2 \cdot 12^C_3 = 33,660$$

--- How many study groups of at most 3 males can be formed?

Ans

18 m  
12 f

$$\begin{aligned} & 18^C_0 \cdot 12^C_5 = 792 \\ \text{or} & 18^C_1 \cdot 12^C_4 = 8910 \\ \text{or} & 18^C_2 \cdot 12^C_3 = 33,660 \\ \text{or} & 18^C_3 \cdot 12^C_2 = 53,856 \end{aligned}$$

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$$97,218$$

committees

19) *Flower Arrangements:* A florist bucket has 8 red carnations, 5 white daises, and 4 blue carnations.

How many bouquets can be made where each bouquet has 2 of each type of carnation and one white daisy?

$$\begin{array}{r} 8C_2 \cdot 5C_1 \cdot 4C_2 = \\ 28 \cdot 5 \cdot 6 = 840 \end{array}$$



20) *Talent Contest*: Fifteen people entered a talent contest. The top three contestants will each win \$50 and everyone else will get honorable mention. In how many different ways can three winners be chosen?

21) *Geometry*: How many lines are determined by five points, no three of which are collinear? Remember, two points determine a line.

22) *Committees*: How many different committees of four can be chosen from twelve people?

23) *Cards*: How many different 5-card hands can be chosen from a 52-card deck?